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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/519,724	12/28/2004	Franz Laermer	10191/3980	5180

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KENYON & KENYON LLP
ONE BROADWAY
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EXAMINER

DHINGRA, RAKESH KUMAR

ART UNIT	PAPER NUMBER
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1763

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/28/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/519,724

Applicant(s)

LAERMER, FRANZ

Examiner

Rakesh K. Dhingra

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 December 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 14-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 14-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 December 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 12/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1) The listing of references in the Search Report is not considered to be an information disclosure statement (IDS) complying with 37 CFR 1.98. 37 CFR 1.98(a)(2) requires a legible copy of: (1) each foreign patent; (2) each publication or that portion which caused it to be listed; (3) for each cited pending U.S. application, the application specification including claims, and any drawing of the application, or that portion of the application which caused it to be listed including any claims directed to that portion, unless the cited pending U.S. application is stored in the Image File Wrapper (IFW) system; and (4) all other information, or that portion which caused it to be listed. In addition, each IDS must include a list of all patents, publications, applications, or other information submitted for consideration by the Office (see 37 CFR 1.98(a)(1) and (b)), and MPEP § 609.04(a), subsection I. states, "the list ... must be submitted on a separate paper." Therefore, the references cited in the Search Report have not been considered.

Applicant is advised that the date of submission of any item of information or any missing element(s) will be the date of submission for purposes of determining compliance with the requirements based on the time of filing the IDS, including all "statement" requirements of 37 CFR 1.97(e). See MPEP § 609.05(a).

In this case, foreign patent documents (00 51938, 2001 267241, 2 332 302, 199 19 469), and Other Document (Article- Joudan et al) as cited in the IDS have not been considered, since copies/abstracts of the same have not been supplied.

2) The information disclosure statement filed 12/28/04 also fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered. It has been placed in the application file, but the information referred to therein has not been considered as to the merits. Applicant is advised that the date of any re-submission of any item

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of information contained in this information disclosure statement or the submission of any missing element(s) will be the date of submission for purposes of determining compliance with the requirements based on the time of filing the statement, including all certification requirements for statements under 37 CFR 1.97(e). See MPEP § 609.05(a).

In this case copies of Foreign patent documents (199 19469, 43 17 623) and Other Documents (extract from Hofmann-Rudorff) have not been supplied.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 14, 16-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Yanagisawa et al (US PG PUB No. 2001/0007275).

Regarding Claims 14, 16: Yanagisawa et al teach a plasma apparatus (Figure 1) comprising:

A discharge tube 2 (plasma reactor) with plasma generating means (including magnetron 10, waveguide 11 with tuner 14, isolator (normally includes circulator) 15 and reflection plate (terminator)

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13, by which plasma can be generated in the discharge tube 2, gas supply means (including gas bombs 31, 32, 33 and gas flow controllers 34, 35, 36) via which a first and second gas could be supplied to the discharge tube 2 (plasma reactor), and reactive species are supplied via the gas outlet pipe 20a (paragraphs 0044-0053).

Applicant has invoked 35 USC 112 sixth paragraph in respect of claim limitations a) "plasma generating means" as included in specification at page 11, lines 10-37 {including a microwave waveguide 150, magnetron 170, terminator 180, tuner 155}. The structure of prior art as disclosed above is similar to the plasma generating means disclosed by the applicant;

b) gas supply means as included in specification at page 4, lines 25-30 {including gas bottles 21, 25 and mass flow regulators 22, 26}. The structure of prior art as disclosed above is similar to the gas supply means as disclosed by the applicant.

Further, claim limitations pertaining to generation of chlorine trifluoride is a functional limitation, and since the prior art apparatus meets all the structural limitations of the claim, the same is considered capable of meeting the functional limitation.

Regarding Claim 17: Yanagisawa et al teach the plasma reactor includes a tube 2 made from aluminum oxide (paragraph 0049).

Regarding Claim 18: Yanagisawa et al teach gas supply means with flow controllers 34, 35, 36 by which the quantity of first and second gases supplied is adjustable (paragraphs 0050, 0063).

Regarding Claim 19: Yanagisawa et al teach an etching apparatus (Figure 1) comprising processing chamber 6 connected to plasma reactor 2 via gas outlet 20a, and substrate W is situated in the process chamber 6 and is exposed to excited gases generated by the plasma reactor 2. Further, claim limitation pertaining to generation of gaseous chlorine trifluoride is a functional limitation, and since the prior art apparatus meets all the structural limitations of the claim, the same is considered capable of meeting the functional limitation.

Claim 14, 15 are rejected under 35 U.S.C. 102(e) as being anticipated by Mahawili (US patents 6,783,627, which incorporates US patent No. 5,814,365)

Regarding Claims 14, 15: Mahawili teaches a plasma apparatus (Figures 2-6) comprising:

A plasma generator 114 (plasma reactor) with plasma generating means (including RF coil, matching network 124 and HF power supply 122), by which plasma can be generated in the plasma generator 114, gas supply means (including plurality of gas injection tubes 46 with flow control regulators – as per column 7, lines 5-15, of US Patent No. 5,814,365 - Mahawili) via which a first and second gas could be supplied to the plasma generator, and reactive species are supplied via the gas outlet (outlet pipe of plasma generator) [column 3, line 30 to column 6, line 63 and column 8, line 58 to column 9, line 20].

Applicant has invoked 35 USC 112 sixth paragraph in respect of claim limitations a) “plasma generating means” as included in specification at page 9, line 34 to page 10, line 30 {including an RF coil 110, high frequency generator 130 and matching network 120}. The structure of prior art is similar to the plasma generating means disclosed by the applicant;

b) gas supply means as included in specification at page 4, lines 25-30 {including gas bottles 21, 25 and mass flow regulators 22, 26}. The structure of prior art as disclosed above is similar to the gas supply means as disclosed by the applicant.

Further, claim limitations pertaining to generation of chlorine trifluoride is a functional limitation, and since the prior art apparatus meets all the structural limitations of the claim, the same is considered capable of meeting the functional limitation.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 20, 22, 25, 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bhardwaj et al (WO 00/51938 which is similar to US Patent No. 6,929,784) in view of Comita et al (US Patent No. 6,042,654) and Charlet et al (US Patent No. 5,047,115).

Regarding Claim 20: Bhardwaj et al teaches a method for generating chlorine trifluoride (ClF₃) [Figure 1] using:

A reaction chamber 2 for formation of ClF₃;

First gas (Chlorine) supply 3 and second gas (Fluorine) supply 4 for supplying reactant gases to the reaction chamber, wherein ClF₃ is produced in the reaction chamber by reaction between chlorine and fluorine at a high temperature of about 400 degrees C and supplied to a process chamber 1 to be used for further processing of substrates. Bhardwaj et al also teach use of ClF₃ for plasma etch applications (column 2, line 1 to column 4, line 65).

Bhardwaj et al teach a thermal reaction method for producing ClF₃, but do not teach a high density plasma method for generating ClF₃.

Comita et al teach a method for cleaning chamber deposits using chlorine radicals where chlorine radicals are thermally generated. Comita et al further teach that when the radicals are generated by plasma, higher radical density about 1×10^{14} per cm³ is obtained (like in a high density plasma) as compared to when the radicals are thermally generated. High density plasma generation using inductively coupled or microwave coupled means are well known in the art. Further, Comita et al also teach that

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instead of chlorine radicals, chlorine trifluoride (ClF₃) could also be used to provide similar results. (column 6, lines 40-65 and column 8, lines 52-62).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to generate ClF₃ by plasma instead of by thermal means as taught by Comita et al in the method of Bhardwaj et al to obtain higher density of ClF₃ radicals.

Bhardwaj et al in view of Comita et al do not explicitly teach high density plasma generating method for generating ClF₃.

Charlet et al teach a microwave plasma generation method for etching using gas plasma wherein gaseous medium used for formation of plasma comprises non-carbon containing fluorinating gas, an oxidizing gas such as oxygen and one other gas which could be chlorine (abstract and column 2, lines).

Though Charlet et al do not explicitly teach formation of ClF₃, it would be obvious to generate chlorine trifluoride for etching of substrate in view of teaching of Comita et al that ClF₃ when used in a plasma excited state would yield higher density of plasma radicals thus improving etching selectivity.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use microwave plasma generating means for generating ClF₃ by plasma as taught by Charlet et al in the method of Bhardwaj et al in view of Comita et al to obtain higher density of ClF₃ radicals, thus enabling higher etch selectivity.

Regarding Claim 22: Bhardwaj et al teach that chlorine and fluorine are used for generating ClF₃ (column 3, lines 5-50).

Regarding Claim 25: Bhardwaj et al teach the ratio of fluorine to chlorine atoms as 65-85 % fluorine and 15-35 % chlorine (that is about 3: 1, as per claim limitation) [column 5, lines 5-20].

Regarding Claim 26: Comita et al teach that density of plasma radicals is 1×10^{14} (meets the claim limitation of at least 10^{12} particles per cm³). 12).

Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bhardwaj et al (WO 00/51938 which is similar to US Patent No. 6,929,784) in view of Comita et al (US Patent No. 6,042,654) and Charlet et al (US Patent No. 5,047,115) as applied to claim 20 and further in view of Rajagopalan et al (US Patent No. 6,274,058).

Regarding Claim 21: Bhardwaj et al in view of Comita et al and Charlet et al teach all limitations of the claim including generating ClF₃ by plasma that has high density of radicals, but do not teach that the plasma generating means are inductively coupled or microwave plasma. However it is known in the art to use inductive or microwave plasma generation means for generating high density plasma, as per reference cited below.

Rajagopalan et al teach a high density microwave plasma apparatus (Figures 7) comprising: a plasma reactor 72 where plurality of reaction gases could be supplied and where the generated radicals are then supplied to a process chamber 110 for substrate processing. Rajagopalan et al also teach that reaction gases could include Cl₂, F (like for generation of ClF₃).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use microwave plasma generating means as taught by Rajagopalan et al in the apparatus of Bhardwaj et al in view of Comita et al and Charlet et al as an recognized method for generating high density plasma.

Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bhardwaj et al (WO 00/51938 which is similar to US Patent No. 6,929,784) in view of Comita et al (US Patent No. 6,042,654) and Charlet et al (US Patent No. 5,047,115) as applied to claim 20 and further in view of Mori et al (US Patent No. 6,136,214).

Regarding Claim 23: Bhardwaj et al in view of Comita et al and Charlet et al teach all limitations of the claim except oxygen being supplied as an additional gas to plasma reactor or to the process chamber.

Mori et al teach a method for etching silicon oxide film on semiconductor substrates using ClF₃ as an etching gas and where oxygen was also supplied as an additional gas (column 20, lines 5-18).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use oxygen as an additional gas supplied to the process chamber as taught by Mori et al in the apparatus of Bhardwaj et al in view of Comita et al and Charlet et al for enhancing selective etching of silicon oxide films (column 20, lines 30-38).

Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bhardwaj et al (WO 00/51938 which is similar to US Patent No. 6,929,784) in view of Comita et al (US Patent No. 6,042,654) and Charlet et al (US Patent No. 5,047,115) as applied to claim 20 and further in view of Ikeda et al (US Patent No. 6,953,557).

Regarding Claim 23: Bhardwaj et al in view of Comita et al and Charlet et al teach all limitations of the claim except a filter downstream from the plasma reactor for separating HF.

Ikeda et al teach a method where harmful gases like HF are removed from the etching gases like ClF₃ using a removing apparatus (like a filter). Further, these removing apparatus (like stirring tank 5) are installed down stream of the plasma reactor (exhaust line 1) [column 1, lines 15-35 and column 4, lines 10-60).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use filter for separating/treating gases like HF as taught by Ikeda et al in the apparatus of Bhardwaj et al in view of Comita et al and Charlet et al to separate out harmful components from the etching gases like ClF₃.

Conclusion

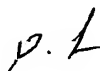
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Rakesh Dhingra



Parviz Hassanzadeh
Supervisory Patent Examiner
Art Unit 1763